MAY 16 1933

SCIENCE NEWS LETTER

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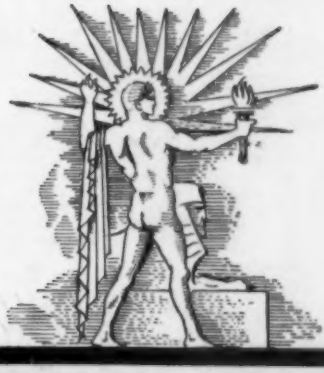
THE WEEKLY SUMMARY OF CURRENT SCIENCE •



MAY 13, 1933

Rising Silently To Protect Nation's Time

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The Weekly Summary of Current Science

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DO YOU KNOW?

The first record of using explosives in mining goes back to 1627.

Approximately two-thirds of the world's production of camphor is used by makers of plastics.

Psychological tests at the University of California indicate that the slow thinker is not necessarily dull.

A check-up of the number of carriers of typhoid and paratyphoid fever in New York State showed 620 of them in 1932.

At the present rate of ice recession, the glaciers of Mount Rainer National Park probably will disappear in a few thousand years.

The Chalice of Antioch, believed by some experts to date from the first century A.D. and associated with Christian tradition, will be exhibited at the Chicago Fair.

The Great Comet of 1811 was bigger than the sun.

A Roman theater of the first century B.C. has been unearthed at Merida, Spain.

A new use for cotton is in making bearings for machinery operating at very high pressures.

A new German process produces a thin oxide coating on aluminium, thus protecting the aluminium from corrosion.

A new material for dental plates is said to have unusual strength, to retain its form indefinitely, and to have the natural color of skin tissue.

According to the National Industrial Conference Board, the industrial population of the United States has lost more than half of its 1929 purchasing power.

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These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information of the article, but are references for further reading. Books cited can be supplied by Book Dept., Science News Letter, at publishers' prices, prepaid in U. S.

ACOUSTICS

Passing Sound Through Gases Helps Study of Molecules

Water Inspires Oxygen Molecules to Pick Up Sound Waves Making Hearing Difficult in Atmosphere of Oxygen

IT IS LUCKY we do not live in an atmosphere of straight oxygen—at least in weather of desert humidity. We would not be able to hear sounds of high pitch at any considerable distance. Recent investigations carried out in the University of California at Los Angeles suggest that the excessive absorption of sound in air of certain humidities is due to collisions between oxygen and water molecules. Prof. Vern O. Knudsen described to the meeting of the Acoustical Society of America at Washington, the Los Angeles experiments, in which Dr. H. O. Kneser, visiting physicist from the University of Marburg, cooperated.

Sound travels freely through chemically dried air, particularly at low tempeatures, according to the electrical recording instruments of the California laboratory. Perhaps this accounts for the common opinion that audibility is keen on a clear, cold night. The introduction of small quantities of moisture promptly damps off the sound, especially tones of high pitch. Peculiarly, this phenomenon does not occur when pure nitrogen is substituted for the air, in spite of the fact that air is nearly 80 per cent. nitrogen. A shift to pure oxygen in the experiment reveals this latter gas as the guilty party. But oxygen alone is rather ineffective. Water vapor must also be present to affect the sound waves.

Drs. Knudsen and Kneser find their experimental records in agreement with the theory that the water molecules catalyze, or inspire oxygen molecules to pick up sound waves, convert them into heat or other motion, and thus destroy the sound. The extent to which all this occurs varies greatly with the frequency or pitch of the sound. Peculiar results may thus turn up. For example, the consonants in spoken words, which in general are of high frequency, are damped off more than the vowels of low pitch. Or in the symphony orchestra concert, if the humidity is at a certain value—not too high or too low—the message from the piccolo gets lost before it gets to the rear of the hall. Thus arises one more good argument for the new art of air-conditioning in public buildings.

More important, possibly, than the acoustic applications, is the possibility of interpreting molecular chemical reactions from the behavior of sound waves. Heretofore the vibrational responses of atoms have been supposed to require the enormous frequency values of light—whence the modern science of spectroscopy. Now it appears that even sound waves, counting but a few score or a few hundred per second, have a definite relation to intramolecular forces. Preliminary experiments by Dr. Knudsen on ammonia, hydrogen sulfide and other gases show decided variations in behavior of the different chemical species. Thus we have a new mode of attack on the age-old mystery of molecular composition and the behavior of objects too small to be seen individually.

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ANCESTOR OF AUTO MASCOT

ARCHAEOLOGY

Lucky Fish Found In Abraham's Town

IF YOU HAVE a bird, beast, or fish perched on the radiator cap of your car, take a look at the ancestor of modern sporty mascots in the picture on this page. It is a good-luck fish unearthed at Abraham's home town, Ur of the Chaldees, and it brought luck to somebody in Abraham's day.

The Chaldeans had no roadsters. They used fish mascots around the temples to the God of Running Water. A fish was a symbol of fertility, and they hoped to bring fertility to the fields by special charms. (*Turn Page*)

IMMUNOLOGY

Injected Poison From Germ May Prevent Pneumonia

PNEUMONIA attacks may be warded off by hypodermic injections of the poison produced by the pneumonia germ, it appears from studies by Dr. Arthur F. Coca of Cornell University Medical College.

"The pneumococcus (pneumonia germ) produces a substance which is highly poisonous for human beings but much less so for lower animals" he explained.

Apparently this toxin may be the important injurious agent of the pneumococcus, in which case Dr. Coca's experiments indicate that it will be easy to give people resistance or immunity to pneumonia as is now done for smallpox, typhoid fever and diphtheria.

When this poison or toxin is injected into human beings, an antitoxin is formed in the blood which enables the individual to resist the toxin, giving him what physicians call immunity to it. Two injections of toxin produced immunity in two-thirds of the susceptible children within three weeks, Dr. Coca reported.

Patients recovering from pneumonia are almost always immune to the toxin, skin tests showed. Their blood serum has been found to neutralize the toxin.

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This fish from Ur is one to inspire fish stories. It is 4000 years old, and therefore may claim the record to be the world's oldest fish—pending the appearance of a rival for the championship. It is also the biggest of its sort archaeologists have found. It is a carp and made of terra cotta.

The good-luck fish has been brought to the Museum of the University of Pennsylvania from Ur, where the Museum and the British Museum have been excavating. Miss Louise Cross of the University Museum staff is holding the lucky fish.

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MEDICINE

New Disease Caused By Yeast-Like Organism

A CASE of a new and unique disease, caused by a yeast-like organism, was reported by Drs. G. H. Hansmann and J. R. Schenken of Iowa City to the American Association of Pathologists and Bacteriologists meeting in Washington this week.

The patient was a white man, forty-three years old at the time of his death, according to the doctor's records. For the last 16 years of his life he had suffered from a refractory skin ailment. This first appeared on the skin back of his knees in 1916. By 1929 the entire skin was involved. The ailment consisted of a scaly inflammation, underneath which the skin was somewhat thickened and reddened. During 1929 the skin became more reddened and thickened and cracked easily. In June of 1932 hard elevated spots, something like pimples, appeared. Late in July the patient developed a high fever with signs of pleurisy, and died on August 7.

Examination of one of the elevated spots from the skin and of one of the lymph nodes, which had become enlarged, showed that both contained a small organism which appeared as a small yeast. This same organism was also found in the lungs and adrenal glands.

Guinea pigs, rabbits, rats and dogs develop the same sort of skin disease when infected with this organism.

The yeast-like organism causing the disease is smaller than any heretofore described and probably belongs in the Oidium group, the Iowa City investigators told fellow-scientists. The character and distribution of the lesions in man are unlike any other disease.

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AVIATION

Faster Flying, Slower Landing Airplanes Being Achieved

TOMORROW'S flying machine will fly technical circles around the airplanes of today, just as 1933 models are superior in engineering, speed and economy to airplanes of a few years ago.

Aviation's experts have just been allowed to peer behind the scenes of America's future in the air through the annual inspection trip of the Langley Field, Va., research laboratories of the National Advisory Committee for Aeronautics.

Working with the world's largest wind tunnel, the world's most advanced testing tank and a score of other unique research devices, several hundred engineers and scientists are conducting there for Uncle Sam the world's most effective attack on aeronautical problems.

The major problem confronting airplane designers is, paradoxically, how to make ships that will fly faster and land slower. In the past five years, airplane speeds have been increased by some 30 to 50 per cent., for example, from 120 to 170 miles per hour, by the simple economical procedure of making the airplane easier to shove through the air by reducing its resistance or "drag." A cowling or shield for aircooled engines developed by the National Advisory Committee for Aeronautics a few years ago is now practically standard equipment on all airplanes, and it alone when added to an airplane jumps up its speed some 20 miles per hour. The N.A.C.A. engineers have also found through wind tunnel tests the best place to locate engines on various kinds of multi-engined airplanes and again many miles per hour have been added to speeds.

Now the N.A.C.A. engineers are combating "parasitic drag" still further by streamlining parts of the airplane. Special attention is being given to the junction of the wing and the fuselage. By "fairing" this joint so that air flows over it smoothly instead of creating wasteful turmoil, additional thousands of dollars yearly will be saved to the industry and the public.

Little projections protruding from airplane wings often cause large losses in unnecessary resistance to the air. Years ago the N.A.C.A. showed that a piece of piano wire is as hard to push through the air as a large strut properly streamlined. Now it has been demonstrated how much of a drag rows of rivets or round-headed tacks on the wings create. Nine rows of rivet heads on a wing of 300 square feet area, use 30 horsepower when the plane is traveling 200 miles per hour.

Because cruising speeds have been increased so markedly through making the drag less, there is now difficulty in obtaining landing speeds sufficiently slow to be safe, that is, not more than 60 to 70 miles per hour. Auxiliary wings and devices of various sorts are being developed in order that the pilot when about to land can convert with the throw of a lever his airplane into a slower craft of higher lift. In a sense, these safety "high-lift" devices are "brakes" in the air, although the problem is complicated by the necessity of arranging them so that control of the airplane is not lost at the lower speeds.

One of the many combinations devised and tested in the N.A.C.A. wind tunnels is a combination of the Handley Page slot and the Fowler wing device. This increases the maximum lift to nearly three times that of the ordinary wing to which these devices are attached.

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PHYSIOLOGY

Study on Catfish Shows How Nerve Dies

THE HUMBLE catfish has served the cause of science by giving neurologists a chance to study at leisure what happens when a nerve is cut. Changes in the injured nerves of warm-blooded animals take place too rapidly to give a good picture, so the cold-blooded fish was called into service by Prof. G. H. Parker and V. L. Paine of Harvard University.

They found that when a nerve is cut, degeneration sets in over the whole part beyond the point of severance, beginning near the cut and proceeding outward. This is contrary to what has hitherto been assumed to be the case with injured nerves.

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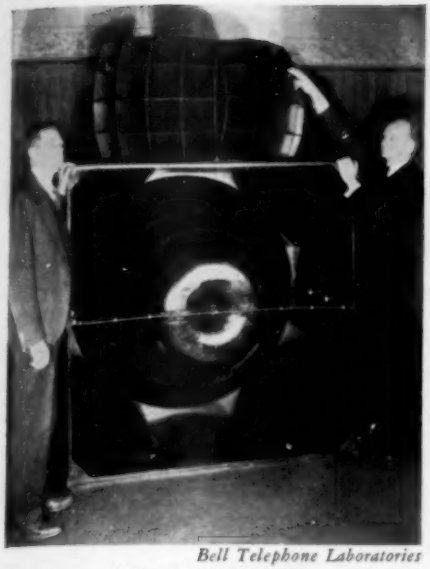

Bell Telephone Laboratories

LOUD SPEAKER

And this is not a misnomer, for power equal to five million voices can be radiated from this apparatus, one of three used in the demonstration transmission of symphony orchestra music from Philadelphia to Washington. (SNL, Apr. 22, '33, p. 243). The multi-channel horns make possible adequate distribution of high frequency sound over a large area.

ARCHAEOLOGY

Unknown Pueblo Periods Turned Into Dated Eras

ARCHAEOLOGISTS are rapidly nearing their goal of turning prehistory into history in the Southwest, declared J. C. McGregor of the Museum of Northern Arizona.

Since so many sites have been definitely dated by the Douglass tree-ring calendar, the time is approaching when archaeologists can talk about ancient Southwest happenings in exact dates.

The Museum of Northern Arizona has been working for three years to establish dates for the periods of prehistory now vaguely called Pueblo I, II and III, Mr. McGregor reported.

"Pueblo I gives every appearance of ending about 700 A.D.," he said. "Pueblo II extended to about 1000 A.D.; Pueblo III to about 1300 A.D.; Pueblo IV to about 1600 A.D., while another division in Pueblo V runs to roughly 1900."

Besides dating these periods, it has been possible to show the dates when different types of houses developed in the Southwest. The time when about 60 different types of pottery were made has also been dated.

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MEDICINE

Sex Hormone Injected to Cure Common Infection of Children

Novel Treatment May Solve Distressing Medical Problem and Point Way to New Methods of Therapy

SUCCESSFUL treatment of a bacterial disease by a sex hormone has recently been announced by Dr. Robert Lewis of New Haven.

A well-known infection of children, caused by the germ *Neisseria intracellularis*, is the condition which has been alleviated by the injection of theelin, the newly crystalized female sex hormone. From a practical standpoint this treatment may solve a distressing problem for many doctors and patients and from a scientific point of view it may point the way to new lines of therapy.

The use of various glandular extracts in the treatment of different metabolic disturbances has become well established in the past decade. Diseases of the thyroid gland in which there is a deficiency of secretion are routinely treated with the hormone, thyroxin from the thyroid gland.

But Dr. Lewis has used the sex hormone to alter the normal development of certain structures of the individual so that a bacterial infection is no longer able to thrive.

The disease (gonococcal vaginitis) he treated is found in young girls. It is highly contagious and so constitutes an important problem in schools and institutions where it is difficult to isolate infected individuals. None of the many antiseptic treatments which have been in use for many years has been satisfactory. Usually the condition disappears at puberty.

Dr. Lewis studied the structure of the part usually affected by the *Neisseria intracellularis* and found that it changed with age, being only a few layers of cells thick in the infant and many layers thick in the adolescent. And by adolescence the infection is usually gone. Assuredly there might be the possibility of a correlation between the thickness of the cellular wall and the disappearance of the infection.

Then Dr. Lewis remembered that Dr. E. Allen of St. Louis had found that the injection of theelin, the female sex hormone, causes a thickening of the lining of the vagina in immature female monkeys. Believing that such a layer of cells might produce an environment which was unfavorable for the growth of bacteria and that he might thus protect children from the disease, Dr. Lewis proceeded cautiously to give injections of theelin to his patients. And just as in the monkeys in Dr. Allen's laboratories, the lining of the wall thickened and at the same time the infection cleared up. He asked Dr. J. R. Miller of Hartford to try some on his patients and again another group of doctors in the Johns Hopkins Hospital. And in all three places the infections treated with theelin have disappeared.

Whether this "cure" is permanent or not, Dr. Lewis is not willing to say. One case apparently had a second attack, which, however, again disappeared with another set of theelin treatments. The others have been under observation six months without recurrence, so that Dr. Lewis hopes his treatment may be of great help, though he emphasizes that until further work is done theelin must be used with great caution.

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PSYCHOLOGY

Isolated Chicks Tried To Chum With Mice

THE IDEA that "Birds of a feather flock together" because of some inborn social instinct failed of confirmation in experiments reported by Frank A. Pattie, Jr., of Rice Institute.

Although chicks brought up in the usual manner do have a tendency to associate with others of their own kind, chicks that have been hatched and raised in isolation show no such preference for chick society, he found. When placed in a pen separated by glass windows from chicks on one side and from white mice on the other, the isolated chicks spent just about as much time trying to reach the mice as they did trying to join their brother chicks.

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ANATOMY

Brains of Great Men

Heavy and Wrinkled Brains do Not Make Geniuses; It is The Blood Supply That Counts, A Noted Scientist Finds

By JANE STAFFORD

SCIENCE has discovered a new secret of greatness. It has found for the first time a significant difference in physical structure between the brain of the average man and that of the scholar.

This difference is not a matter of the size, weight, or convolutions of the brain, but of its blood supply. And this difference may very well explain why the scholar's brain functioned more brilliantly than that of his less-gifted brother which was as large and heavy.

The difference in blood supply to the scholar's brain and to that of the man in the street and its significance have been brought to the attention of scientists by Prof. Henry A. Donaldson, of the Wistar Institute of Anatomy and Biology in Philadelphia. Prof. Donaldson has for many years been examining the brains of distinguished scientists and other scholars after their death and also brains of patients dying in hospital wards—brains of average or less than average ability and attainments.

Measuring and weighing and dissecting these brains, Prof. Donaldson sought the elusive something that differentiated them intellectually while their owners were alive. He thinks he has found it, or at least a clue to it, in the structure scientists call by the Latin name of *pia mater*.

This *pia mater*—the words mean, literally, tender mother—is a very delicate membrane that covers the brain like a wrapper of cellophane. It is as thin as the finest tissue paper, only much more pliable. It follows tightly the entire surface of the brain, dipping down into the fissures and carrying with it the chief blood vessels of the brain.

If you have ever watched calves' brains being cleaned out and prepared for cooking, you have probably noticed that the cook pulled off blood clots and a thin, white stringy stuff that the clots were attached to. The thin stringy stuff was the remains of the *pia mater*, and the blood was that which had clotted in the veins and arteries after death.

During his examination of the brains in his laboratory, Professor Donaldson carefully removed this membrane, laying it aside for later consideration, while he first examined the brains themselves. He did this because recent studies have shown that the blood vessel arrangement in the pia mater varies considerably in different persons, and that its variations are significant.

This matter of the blood vessels seemed to Professor Donaldson to be of considerable importance. Most of the early studies of the brain, he reflected, considered it only after death, when it was an organ at rest without any driving power. After all, it seemed only natural that the driving power which kept the brains at work should be more important than their shape or size in respect to the quality of work they did.

"Broadly speaking, this driving power which puts the brain to work during life is the blood, and the conditions determining the supply of blood are fundamental," he explained when reporting his views and studies to the American Psychiatric Association.

The best of brains, he pointed out, makes a poor showing in a fainting individual. Fainting is a condition in which most of the blood is withdrawn from the brain.

More Blood, Better Work

A good indication of how well the brain was supplied with blood might be found in the blood vessels of the *pia mater*, he thought. Another scientist, he remembered, B. Hindze, made a special study of these blood vessels in both mentally superior and ordinary persons. He found a positive correlation between the complexity of the blood vessel arrangement and the mental grade. The higher the mental grade, the more elaborate the blood vessel arrangement in the pia mater. While it is not possible to tell about the number of smaller blood vessels surrounding the nerve cells of the brain from the complexity of the larger vessels of the pia mater, it is safe to infer that when the pia mater contains many vessels, the nerve cells are also well supplied.

"There is no question," Professor Donaldson stated, "that the brain, like a muscle, works better with an ample blood supply. So, at last, we have a partial reason why one brain works better than another."

If brain functioning is a matter of nourishment, then not only the quantity but the composition of the blood must play a part. One group of investigators has found that through the blood, the state of the nerve cells in the brain can be greatly changed, and with this change the mental processes show a corresponding range of change. However, only the beginning steps have been taken in this direction. While science may never find a way to increase the number of blood vessels in your *pia mater*, it may some day be able to tell you what to eat to improve your mental ability by improving the quality of blood supplied to your brain cells.

Bumps Thought Important

However, the blood is only one factor influencing mental ability, Professor Donaldson suggested. Other important factors may be the structure and chemical composition of the nerve cells in the brain. So far, however, not much has been discovered about these factors.

Scientists have been trying for over a century to find the thing that made the scholar's brain different from the ordinary man's. Some of the earliest of these studies resulted in Franz Gall's system of phrenology. Gall's work was published in 1810. While Gall's ideas never attained any scientific standing, they attracted much attention and many followers. You have perhaps sometime in the past had some phrenologist "feel the bumps" on your head and after consulting his chart tell you what he found to be your character and intellectual traits.

"Gall associated slight elevations of the cranium with assumed elevations of the brain and assigned a so-called faculty to each of them," Professor Donaldson explained. "On the basis of the relative development of these twenty-six bumps, he proposed to read the character of the individual. Evidently this was merely transferring the current method of the physiognomists from the face to the cranium."

After Gall, came the period when the weight of the brain was considered significant and given much consideration by many students of the problem.

"It was assumed that outstanding personalities should have heavier brains, just as powerful men had heavier hearts," Professor Donaldson said.

This theory received many upsets, however. In a very general way it was found to be true, but there were outstanding cases of men of great ability whose brains actually turned out to be exceedingly lightweight. Lord Byron, the English poet, had, it is true, a very heavy brain, the heaviest on record, weighing nearly five and one-half pounds.

Scholar's Light Brain

On the other hand, Anatole France, French scholar and writer of great ability and renown, surprised the scientists by having a very light brain, which weighed only two pounds, four ounces, which is almost a pound lighter than the brain of the average farm laborer. Another small but powerful brain was Napoleon's. Louis Agassiz, the distinguished American naturalist, had a rather large head but his brain was relatively lightweight weighing just over three pounds.

Besides weight, brains have been studied and measured from other aspects. The complexity of the convolutions and fissures of the brain have been sometimes considered of significance, and the relative size and weight of the various parts have also been given considerable attention.

Another of the early investigators of the problem was Rudolph Wagner, who, in 1860, made a study of three eminent scholars and an artisan. Wagner, and the scientists who came after him, found very little significant difference between the brains of the intellectuals and of the average or less than average individuals. Among the brains of the scholars examples were found of both simple and complex fissuration. After the modern idea of localization of brain functions was established, the search for the cause of great mental ability was eagerly followed along that line. The different parts of the brain were studied separately and in relation to each other.

This study of brains attracted considerable attention and you may remember that it became quite fashionable to bequeath one's brains to some laboratory for study.

Professor Donaldson explains it as follows:

"Some fifty years ago a cry went up from the brain anatomists for 'more and better brains.' With few exceptions their work had been carried on with so-called hospital material and it was thought that if brains from those of somewhat higher mental grade could be studied, some of the bothersome questions might be illuminated.

"This led to the formation of anthropometric societies or similar groups among the intellectuals, whose members kindly consented to bequeath their brains for study.

Untaxed Bequest

"The appeal is attractive for it represents an interest in science and it further represents that rare form of bequest, namely, one which has not yet been taxed."

One of these groups is the Cornell Brain Association at Cornell University, which was founded by Dr. Burt Green Wilder.

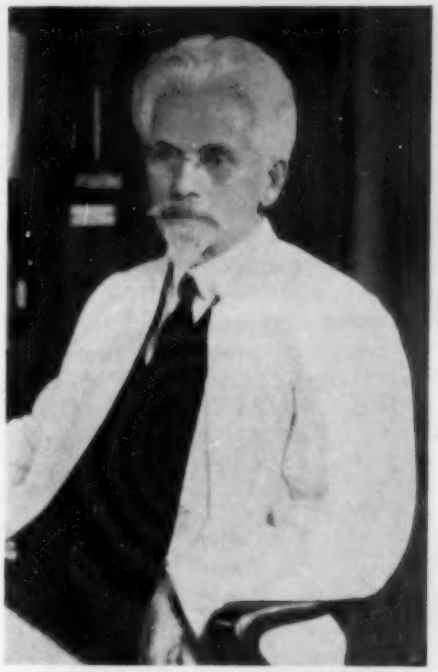
Professor Donaldson's own studies at the Wistar Institute were made on the brains, among others, of Laura Bridgman, the deaf-mute; G. Stanley Hall, the eminent psychologist; Edward S. Morse, widely known naturalist and zoologist; and Sir William Osler, distinguished physician, teacher and author.

Working with these and other brains, Professor Donaldson made all the classical measurements and in addition devised methods of his own for comparing the brains of the élite with those of the average person. He weighed the brain and weighed separately different parts of it. Greater weight in brains is probably due to heavier nerve cells rather than to more of them, he found. While he found higher brain weights more often in the brains of the scholars, he found among these brains nearly the same range of weights as among those of the average hospital patient.

"In the individual case," he concluded, "brain weight is not a real indicator of intelligence."

Besides weighing the brains Professor Donaldson made very careful measurements of brain area, taking into account by a special method the area of the grooves and fissures in the surface. But after considering all these measurements, he concluded that while greater weight may be somewhat correlated with higher grade of brain performance, none of the measurements can be counted on to differentiate brains of superior ability from those of average or inferior ability.

No signs of how well a brain worked are to be found in the dead brain, according to Professor Donaldson's studies, except that in a general way a large-sized brain indicates good growth, which is a favorable sign.



PROF. HENRY A. DONALDSON

He has examined the brains of geniuses, men of average intelligence and idiots.

● COLOR CHANGES IN ANIMALS

by

Prof. Earle B. Perkins

Department of Zoology, Rutgers University

This address will be given Friday, May 19, at 1:45 P. M., E. S. T, over the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

▼ RADIO ▲

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METEOROLOGY

1933 Tornadoes Proving Unusually Destructive

PLENTIFUL, short-lived and frightfully fatal. That's how incomplete reports at the U. S. Weather Bureau describe 1933's tornadoes.

The recent storm that took heavy toll of life and property at Minden, La., was pointed out as a typical twister of the current year. Had this tornado occurred over open country of Texas or Oklahoma where they often spend themselves, a Weather Bureau representative said, it would scarcely have been heard of. Instead, it chanced to strike a populous town.

Similarly, a March storm plowed a five-mile furrow through Nashville, Tenn., killing many; and a group of 14 tornadoes took 54 lives in Mississippi during the last two days of the same month. An incomplete estimate places the dead from tornadoes so far this year at well over 200. Since these storms occur most often during spring and summer, it is that the death total will be more than doubled before this year's tornado season ends.

The tornadoes of the past few months spent themselves quickly, seldom cutting paths more than one or two score miles long.

Though tornadoes of 1933 seem to have set standards of quantity, length of life and fatality, Weather Bureau officials carefully point out that these factors are matters of pure chance. The next tornado is just as apt to leave a long path over open plain as to cut a short swath through a city.

Science News Letter, May 13, 1933

HEREDITY

Resistance to Diseases May Be Inherited

RESISTANCE to disease is an hereditary trait like color of eyes, hair or skin, studies with mice at the Rockefeller Institute, New York, show. Strains of mice highly susceptible to or highly resistant to a given disease may be segregated by selective breeding, Dr. Leslie T. Webster reported at the meeting of the American Association of Pathologists and Bacteriologists.

Starting with a strain of mice 37 per cent. susceptible to mouse typhoid, he selected lines 85 per cent. and 15 per cent. susceptible respectively.

The 85 per cent. susceptible lines were descendants of mice highly susceptible to mouse typhoid, while the 15 per cent. susceptibles descended from relatively resistant mice.

Resistance factors are dominant, and not sex-linked, Dr. Webster found.

Mice from strains resistant to disease were heavier but not more fertile than the susceptible mice. The tissues throughout the bodies of these resistant mice seemed less sensitive to the organism causing mice typhoid than did the body tissues of susceptible mice. This suggested to Dr. Webster that the hereditary factors giving resistance to disease exercise general rather than local influence in the animal body.

These hereditary factors concerned with resistance or susceptibility to disease can operate against a number of but not necessarily all harmful agents, Dr. Webster found.

Science News Letter, May 13, 1933

CHEMISTRY

Safe Method Replaces Poison in Copper-Plating

THE CYANIDE bath now widely used for copper plating of steel can be replaced by a new non-poisonous electroplating solution developed by Dr. Colin G. Fink and Chaak Y. Wong of Columbia University, New York, and reported to the Electrochemical Society.

A complex copper salt, chemically known as disodium diaquodioxalatocupriate, is used in the new bath, along with sodium sulphate and boric acid.

The new method will be available for use in large automatic plating installations where strip steel, standard steel parts, etc., are coated with copper as the first step to other coatings. A satisfactory copper deposit is obtained in only one minute with a low electrical current density with the new bath.

The copper cyanide bath is used in electroplating copper upon the more electronegative steel because from it the copper is not deposited by replacement in a loose, non-adherent film as it is from a copper sulphate solution, for example. But there are serious drawbacks to the commercial cyanide bath. It is very poisonous and the hydrocyanic acid formed when acid acts upon the metal cyanide is still more poisonous. Very careful operators must be employed. The cyanide bath is also unstable and deteriorates with use.

Science News Letter, May 13, 1933

IN SCIE

PUBLIC HEALTH

Cancer Less Prevalent In Far Eastern Lands

CANCER is much less prevalent in the Far East than in European or American countries, statistical studies of Dr. Frederick L. Hoffman of the Prudential Insurance Company show.

This disease at present is probably about half as prevalent in the Far East as in the large cities of Europe and America, Dr. Hoffman told members of the American Association for Cancer Research.

Conclusions of far-reaching value are promised by further study of the facts and factors partially revealed by his investigations, he pointed out.

Most impressive is the frequency of cancer of the mouth and cheeks among both men and women of Malaya and the Philippines. This is unquestionably due to the habit of chewing betel nut.

Another significant finding is the relatively low incidence of cancer of the breast in native women.

Cancers of the intestinal tract are much less common in the Malay States than in other parts of the world. Cancer of the skin is relatively uncommon. Cancer of the leg, probably mostly bone tumors, is rather frequent.

Dr. Hoffman reported figures that contradict current ideas to the effect that cancer of the oesophagus or gullet is common among Chinese.

Science News Letter, May 13, 1933

SEISMOLOGY

Severe Earthquake Reported In Mexico

A SEVERE earthquake occurred somewhere near Acapulco, Mexico, at 5:33.7 a. m., eastern standard time, on Monday, May 8, scientists of the U. S. Coast and Geodetic Survey stated after examining records gathered by Science Service from a number of seismological observatories. The epicenter of the shock was given as approximately 16 degrees north latitude, 100 degrees west longitude.

Science News Letter, May 13, 1933

FIELDS

GENETICS

"Blue Babies" Who Grow Up May Bear Children

WOMEN who suffer from congenital heart disease, some of whom may have been "blue babies," are not barred from motherhood if they grow up, Drs. Robert Sterling Palmer and Burton E. Hamilton of Boston reported at the meeting of the American Society for Clinical Investigation in Washington.

This condition is due to improper development of the heart. It will be found in only about one out of three thousand expectant mothers, the Boston physicians told their colleagues. They described eleven cases in which the heart condition of the mothers was no bar to successful child-bearing. Some of the women had several children.

Science News Letter, May 13, 1933

PHYSIOLOGY

Germs Obstruct Their Own Invasion of Body Tissues

THE EXTENT to which disease germs can invade the body depends on the amount of inflammation they cause at the site of their entry, it appears from investigations reported by Dr. Valy Menkin of Harvard University Medical School at the meeting in Washington this week of the American Association of Pathologists and Bacteriologists.

By injecting a dye into the body at a place where bacteria had previously been injected, Dr. Menkin found that staphylococci, the organisms that are found in boils, limit the extent of their invasion to a very small area. They do this by causing a rapid inflammation which results in mechanical obstruction of the draining lymphatics, the avenues by which the disease germs, or other foreign matter, might continue their invasion of the body.

The pneumococcus and the fearsome streptococcus, on the other hand, do not cause such rapid obstruction of these avenues. In the case of the streptococcus, Dr. Menkin found the avenues are open for as long as two days. This gives the disease germs a chance to get far in their invasion of the body and probably accounts for the serious effects on the whole system of infection with these organisms.

Dr. Menkin was able to determine the speed with which the germs could invade the body by watching the rate of progress of the dye which invaded the body just after the organisms had been introduced. When the dye could not proceed any further, he concluded that sufficient inflammation had occurred to obstruct the path for the organisms also.

Science News Letter, May 13, 1933

ASTRONOMY

Infra-Red Light Invades Eclipsed Portion of Moon

WHEN THE MOON partly entered the earth's shadow last September, as seen from Europe, the shaded part reflected less than a thousandth as much violet light as the ordinary full moon, but it sent back to us about one six-hundredth as much infra-red light as the uneclipsed portion. This was determined by photographs taken by Dr. R. L. Waterfield, and just announced to the British Astronomical Association.

The earth's atmosphere bends some of the sun's light around into its shadow, and for that reason the shadow, when it falls on the moon and produces a lunar eclipse, is not entirely dark. Because the longer waves of the red and infra-red light pass through the earth's atmopshere more readily than the shorter blue and violet waves, the eclipsed moon usually has a ruddy color. Dr. Waterfield's data show how much of this light is so refracted into the shadow.

A double camera was used, attached to one of the telescopes at the private observatory of the Rev. T. E. R. Phillips at Headley. This was equipped with two lenses, both forming their images on the same plate, side by side. One lens was covered with a filter passing only infra-red light, the other with a violet filter. A partition in the center of the camera separated the two parts, and a series of pictures was made as the moon entered more deeply into the earth's shadow. Thus the density of the images on the plates could be measured, and the brightness of the part of the moon represented determined. These density measurements were made at the Royal Observatory by Dr. W. M. H. Greaves.

Science News Letter, May 13, 1933

CHEMISTRY

Dust May Replace Water For Fighting Fires

WATER may soon be a thing of the past in fighting fires if fire-fighting dust invented by Prof. Frederick K. Kirsten, aeronautical engineer at the University of Washington, and soon to be placed on the market, is accepted.

Prof. Kirsten has invented a device by which this dust may be played on a fire in an aerated mass through a hose and nozzle. The dust smothers the fire by developing a large quantity of carbon dioxide gas under heat.

In a test directed by the Seattle Fire Department, the dust extinguished in three seconds a roaring blaze in a garage filled with oily rags, crumpled newspapers, cedar shingles, oil and gasoline.

The dust does not absorb water, Prof. Kirsten explained. It looks like coarse flour and flows like water under treatment. A pressure of 200 pounds can be put behind it.

A specially designed fire engine provided with the new fire-fighting dust has been in operation for three months at the Washington State Hospital located at Medical Lake, Washington. Dozens of small fires have been successfully extinguished during that period. Prof. Kirsten's latest application of his new principle is the development of a small hand extinguisher.

It has been estimated that 80 per cent. of the damage incurred at the time of fire is attributable to the water used in putting out the fire.

Science News Letter, May 13, 1933

BACTERIOLOGY

Undulant Fever Bacteria In Vertebrae of Swine

DISCOVERY of bacteria belonging to the Brucella group, which cause undulant fever, in diseased vertebrae of swine was reported by Drs. William H. Feldman and Carl Olson, Jr., of the Mayo Clinic at the meeting in Washington this week of the American Association of Pathologists and Bacteriologists. The animals did not show any signs of disease at the time of slaughter and the organs were healthy-looking. This discovery gives further evidence that swine are a dangerous source of undulant fever infection for farmers, packing house employees, retail butchers, housewives and others who handle uncooked pork.

Science News Letter, May 13, 1933

PHYSICS

Electricity in the Nineteenth Century

"A Classic of Science"

Elihu Thomson Tells the Achievements of Electricity's First Century and Forecasts More Modern Developments

ELECTRICITY DURING THE NINETEENTH CENTURY. By Prof. Elihu Thomson. In Annual Report of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1900. Washington: Government Printing Office, 1901. This is an exact reprint of extracts from the original publication.

HAS SCIENCE any answer to make to the question, What is electricity? We think not; nor has it any answer to make to the question, What is energy? The most that science can possibly expect to do is to extend our horizon and permit us to acquire a deeper knowledge of the intimate relations of things. We speak of the ether as the electrical medium, and we acquire more and more knowledge of its properties and actions as the years go by. Facts are gradually being accumulated by workers in all departments of science, and there must follow generalizations which will bring into harmony the present discordancies where they appear. It will probably be found that the electrical properties of the ether are the fundamental ones on which the universe is built and that the properties of matter, which we speak of as mass, weight, inertia, cohesion, elasticity, etc., are dependent upon or have their origin in the ether properties. Perhaps just as light and radiant heat have been shown to be electrical vibrations, gravitation and the other properties may follow. True it is that electrical laws are most simple, most definite. Electrical measurements can be made with the utmost accuracy and delicacy. Indications these are of its fundamental and universal character.

In order to account for the passage of light, radiant heat, magnetism, and other forces through space science has need of what is called the ether, a medium filling all space and propagating waves of heat and light, as well as magnetic disturbances and gravitation. The sun radiates to the earth luminous waves and heat waves. Moreover, it has been shown that whenever there is a great cyclonic storm upon the sun the earth sympathizes or receives influences which disturb the compass needle. There is reason to believe that the eleven-year sun spot periods find their expression upon the earth in the greater frequency of displays of aurora borealis, magnetic storms, and even thunderstorms following the more active storm period of the sun, when the sun spots are most numerous.

What, then, is the nature of this ether of space? To this question no complete answer can as yet be given, except to say that it is the electro-magnetic medium. It is the ether and not the air which enables a magnet to attract or repel, for the action occurs in the best vacuum, undiminished. It is the ether and not the air which enables an electrified body to act upon surrounding bodies in attracting or repelling them. When we sit in front of an open fire, it is the ether which brings the light and also the heat radiated to us. Early in the century the theory that light consisted of ether vibrations of a particular character became the commonly accepted theory. It remained for Clerk Maxwell, a mathematical physicist of the highest eminence, to put forward, about the middle of the century, the idea that light waves were really electrical waves. Light would, then, become one form of the manifestation of electrical force; and the same would be true of radiant heat. This theory, however, lacked experimental confirmation until the researches of the late Dr. Hertz, too early lost to science. We see references to what are called "Hertzian waves." These are waves identical in nature with light waves, but of much lower pitch or period. Red light consists of about four hundred millions of millions of electrical waves in the ether per second; blue or violet light about double that number. Hertz showed in his experiments that electric sparks between polished balls, under proper conditions, were attended by ether waves of the same nature as those of light, but having a pitch represented by some millions of vibrations per second. These waves, however, could be reflected, could be refracted, could be polarized, and be dealt with as if they were light waves. Ordinary alternating-current waves are, in fact, closely akin to these waves, only their speed is from 25 to 200 or 300 per second. Their "frequency" is low.

When we speak of "high-frequency waves" we usually mean waves of great rapidity as compared with ordinary alternating-current waves. When a Leyden jar is discharged through a short wire, or coil of wire, there is momentarily generated a set of high-frequency waves. This was shown by Henry in the early half of the century. The brilliant effects which have been produced within recent years by Mr. Tesla, as well as by the present writer, in the use of high-frequency discharges of

CELEBRATING

Dr. Thomson (left) on his eightieth birthday, shows Dr. Karl T. Compton, president of Massachusetts Institute of Technology, his first electrical device, a wine-bottle friction machine, built when he was eleven years old. Dr. Thomson's first dynamo stands on the table. Applied electricity has developed during his life-time, and almost every branch of it has felt the impress of his work.

waves are well known. Electric sparks many feet in length are easily generated. Astonishing luminous effects accompany high-frequency experiments. Conductors glow in the dark with a bluish luminosity. Vacuum tubes are caused to give out light many feet away from the apparatus in which the high-frequency discharges are generated.

Most curious perhaps of all, to the lay mind, is the possibility of passing through the body current enough at high frequency to light lamps in circuit with the body, without producing any harmful effects, and, in fact, without producing any sensation whatever. Spark discharges from the apparatus which would seem to have the power to kill instantly are received harmlessly. Indeed, when currents have a frequency more than a certain amount—say 10,000 per second—the physiological effects seem to be in abeyance, as if the rapid reversals of the current could not leave any permanent effect.

Certain forms of moderately high frequency currents give promise of actually producing insensibility to pain without interfering with consciousness, and it is possible that the future may see surgical operations performed with the protection of the subject from painful sensations by the passage of these currents. Up to the present, however, there has been no use actually made in the practice of high-frequency effects, unless we class with such effects those of transmission without wires.

Wireless telegraphy of today is, however, a direct outcome of Hertz's experiments on electric waves. It is but little more than ten years since Hertz announced his results to the world. His work, supplemented by that of Branly, Lodge, and more recently Marconi, has made wireless telegraphy a possibility, and there are indications that enormous distance may yet be covered by this ethereal transmission. Just here we may refer to the fact—for it is a fact—that the electrical energy transmitted over a line, which may be many miles in length, really does not travel by the wire connecting the two points. It travels in the ether surrounding the wire. The wire itself is, in fact, the guiding core of the disturbances in the ether which proceed outward in all directions to unlimited distances. The guiding core or conducting wire is needed to focalize or direct the delivery of the energy. This curious conclusion of science, then, that the power from the power-station travels in the space around the wires led from the station is one of the results of recent electrical studies, just as with light those studies begun by Maxwell and Hertz have led to the inevitable conclusion that the light of the candle, the light of a kerosene lamp, and the light of a gas burner are all in essence electrical phenomena as are all forms of radiation in the ether.

The wireless telegraph of today utilizes a sudden electrical disturbance made at one point, which travels by the surrounding ether in all directions and is picked up in feeble fashion, it may well be, by very sensitive receiving instruments. The shock or disturbance to the ether is thus recognized, and by a preconcerted system of signals the slight disturbances are sent out in a sequence such as to convey intelligible messages. Distances of upward of 100 miles are thus covered with what must be regarded as an extremely feeble means so far as the scale of the apparatus is concerned, and there would seem to be no reason why the scale of operations greatly increased may not in the near future widely extend the range over which wireless telegraphy can work.

The wonderful X ray and the rich scientific harvest which has followed the discovery by Röntgen of invisible radiation from a vacuum tube were preceded by much investigation of the effects of electric discharges in vacuum tubes, and Hittorf, followed by Crookes, had given special study to the effects in very high or nearly perfect vacua. Crookes, though specially enriching science by his work, missed the peculiar X ray, which nevertheless must have been emitted from his vacuum tubes, not only in his hands, but in those of subsequent students. It was as late as 1896 that Röntgen announced his discovery. Since that time several other sources of invisible radiation have been discovered, more or less similar in effect to the radiations from a vacuum tube, but emitted, singular as the fact is, from rare substances extracted from certain minerals. Leaving out of consideration the great value of the X ray to physicians and surgeons, its effect in stimulating scientific inquiry has al-

ANTHROPOLOGY

Many Colors Found In Eyes of Newborn Babies

THE TRADITION that all babies' eyes are blue at birth has been shattered. Taught by physicians, physiologists, and geneticists for many years, this "fact" has been proved a fallacy by the simple means of actually examining under good illumination the eyes of nearly five hundred newborn infants in the hospital of the Johns Hopkins University. Dr. W. C. Beasley, instructor in psychology at the university, made the examination.

Not only were other colors than blue found in the newborn babies' eyes, but brown was found in 79.5 per cent. of the white infants' eyes and 99.3 per cent. of the Negroes'. Many eyes held several colors. Yellowish and reddish browns were seen, and greens, violet, gray and lavender, as well as flecks and streaks of as many as 187 different hues. Only 28 of the 455 infants examined had plain blue eyes.

But there is a reason for the tradition that all white infants have blue eyes. For the eyes at birth have a clouded appearance, due perhaps to lack of clearness in the fluid between the front of the iris and the cornea. This cloudiness acts as a veil to hide the true colors of the eye from the casual observer. The resulting appearance is a murky look which could well be described as dark blue or gray.

If you look at the young baby's eyes closely, however, with bright illumination and some optical aid such as that afforded by a reading glass or pocket microscope, you will be rewarded by seeing the real eye color shine through.

And you will probably notice many things about the eyes that you have never seen before. You may see streaks radiating from the center like the spokes of a wheel. Or you may find a ragged patch, either large or small, surrounding the pupil. Or a narrow ring around the pupil. Or all sorts of flecks, spots, and streaks. Altogether 200 different combinations of these patterns were found to be possible in human eyes.

inquiry has almost been incalculable. The renewed study of effects of electric discharge in vacuum tubes has already, in the work of such investigators as Lenard, J. J. Thomson, and others, apparently carried the subdivision of matter far beyond the time-honored chemical atom, and has gone far toward showing the essential unity of all the chemical elements. It is as unlikely that the mystery of the material universe will ever be completely solved as it is that we can gain an adequate conception of infinite space or time. But we can at least extend the range of our mental vision of the processes of nature as we do our real vision into space depths by the telescope and the spectroscope. There can now be no question that electric conditions and actions are more fundamental than many hitherto so regarded.

The nineteenth century closes with many important problems in electrical science as yet unsolved. What great or far-reaching discoveries are yet in store, who can tell? What valuable practical developments are to come, who can predict? The electrical progress has been great—very great—but after all only a part of that grander advance in so many other fields. The hands of man are strengthened by the control of mighty forces. His electric lines traverse the mountain passes as well as the plains. His electric railway scales the Jungfrau. But he still spends his best effort, and has always done so, in the construction and equipment of his engines of destruction, and now exhausts the mines of the world of valuable metals for ships of war, whose ultimate goal is the bottom of the sea. In this, also, electricity is made to play an increasingly important part. It trains the guns, loads them, fires them. It works the signals and searchlights. It ventilates the ship, blows the fires, and lights the dark spaces. Perhaps all this is necessary now, and, if so, well. But if a fraction of the vast expenditure entailed were turned to the encouragement of advance in the arts and employments of peace in the coming century, can it be doubted that, at the close, the nineteenth century might come to be regarded, in spite of its achievements, as a rather wasteful, semibarbarous transition period?

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GENETICS

Control of Sex in Rabbits Attempted By Electricity

AN ATTEMPT to control the sex of rabbits is reported by Prof. N. K. Koltzov and V. N. Shröder of the Moscow Institute of Animal Breeding in a note to *Nature*. The method involves the use of an electric current and artificial impregnation.

The general theory of geneticists is that spermatozoa carrying the x-chromosomes produce females while those carrying y-chromosomes produce males. The ova all have the x-chromosomes. The Russian investigators reasoned that a method which would separate the spermatozoa carrying x-chromosomes from those carrying y-chromosomes would give a method by which male or female mammals could be bred as desired.

The Russian investigators further believed that the spermatozoa carrying x-chromosomes might carry an electrical charge of opposite sign to those spermatozoa carrying y-chromosomes. Accordingly they tried to separate them by passing an electric current through the sperm suspended in a salt solution. They found that part of the spermatozoa did go to the positive pole, part to the negative pole while the rest remained in the middle of the apparatus.

The Russian investigators artificially impregnated three female rabbits with the different portions of the sperm that had been separated by electricity.

"The female impregnated with the anode spermatozoa produced six young, all of the female sex," they reported; "the second, impregnated with cathode spermatozoa, produced four males and one female; the third, impregnated with the central fraction left between the two poles of the Michaelis apparatus, bore two males and two females."

While the separation of spermatozoa by an electric charge is of interest to scientists, practical application of this method even with lower animals, is considered extremely remote.

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NORMAL CANCEROUS

The dark spot near the center of each cell represents the nucleolus. The larger nucleolus of the cancer cell is suggested as a means of distinguishing it from normal cells with which it might be confused.

MEDICINE

Way Found to Distinguish Cancer Cells From Normal

THE SIZE of the cell nucleolus is the distinguishing feature by which a cancer cell may be told from normal cells, Drs. William Carpenter MacCarty and Eva Haumeder of the Mayo Clinic told members of the American Association for Cancer Research at their meeting in Washington this week.

Medical scientists have long been searching for a method of distinguishing between normal and cancer cells. It is not always possible to tell from its gross appearance whether or not a tumor is malignant.

Surgeons about to remove a tumor generally send a small piece of it down to the hospital laboratory for diagnosis. The pathologist must, within two or three minutes, cut a paper-thin slice from the piece of tumor tissue, fix it on a glass slide, stain it, examine it under the microscope, and report to the surgical team waiting in the operating room whether or not the tissue is cancerous.

But even when examined in this way cancer cells sometimes look so much like certain types of normal, non-malignant cells that it is extremely difficult to make an accurate diagnosis.

Drs. MacCarty and Haumeder have found that the area of the nucleolus in the cancer cell is much greater than the area of normal cell nucleoli. They conclude that the cancer cell has at least one differential characteristic and that this must be used by those who expect to reduce the tremendous mortality from cancer.

The nucleolus is a very small but important part of a cell. For their investigations, the Rochester scientists had to devise a special method of measuring this small area, which they described at the meeting.

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POPULATION

City Population Decreases In Depression's Third Year

Lower Birth Rates and Restricted Immigration Make More Million-a-Year Gains Unlikely for United States

By DR. P. K. WHELPTON, Scripps Foundation for Population Research.

CITIES as a whole decreased in population by over 400,000 persons during 1932 compared with little change in numbers during 1931, data gathered by the Scripps Foundation for Population Research indicate.

This is in great contrast to what occurred prior to the present depression. During each year from 1920 to 1929 the number of city dwellers increased by at least 850,000, the maximum gain being about 2,000,000 during 1923. Even during 1930 there was an increase of about 400,000.

Emigrants Exceed Immigrants

The decline in the city population during 1932 resulted partly from the continued slowing up of growth in the United States as a whole, and partly from an unusually large increase in the farm population. Births have been decreasing more rapidly than deaths in recent years, while the former excess of immigrants has changed to an excess of departures for foreign countries since 1930.

As a result the nation barely gained 800,000 in population during 1932 compared with about 1,200,000 during 1930 and over 2,100,000 during 1923.

At the same time, the farm population, which decreased by 1,450,000 from 1920 to January 1, 1930, increased by 1,000,000 in 1932 alone, according to a report of the Department of Agriculture. The only way the gain in the farm population could exceed that of the total population was by drawing on cities, for the nonfarm population living outside of cities probably increased by at least 200,000 during 1932, continuing the trend of previous years.

Eventual Return to City

Whether the city population as a whole will increase again when the depression is ended or whether the recent decrease will continue remains to be seen. With the birth-rate falling more rapidly than the death-rate, the years of large growth in total population seem a thing of the past unless immigration restrictions are greatly modified; it is doubtful if the United States again will gain 1,000,000 inhabitants in any single year.

It is quite probable, however, that the farm population will not keep on increasing when good times return. Much of its rise in numbers during 1932 seems to have been due to the return to farms of persons who lost their jobs in cities, and more important, the remaining on farms of young people who in normal years would migrate to cities. With a pick-up in employment in urban areas the farm-to-city movement is likely to predominate once more, and most of the nation's increase in population to accrue to cities and their suburbs.

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CHEMISTRY

Alcoholized Gasoline Approved In Tests

ALCOHOLIZED gasoline, scheduled for large use in this country if the Clark-Dickinson-Shallenberger bill now before Congress is enacted, is not entirely a novelty in this country.

It has been given a test under a wide range of motoring conditions in several sections of the country, most notably in the Midwest, where the states of Illinois and Iowa, as well as several private concerns, have made alcohol-blended gasoline available to several sample communities. Advocates of the pending legislation declare that the experience of many hundreds of motorists who have reported on their tests constitutes an almost unanimous endorsement of the alcoholized fuel.

A summary of reports of 1,327 customers, who gave their impressions of alcoholized gasoline on the scores of starting, acceleration, smoothness of operation, anti-knock, power and general motor performance, shows that over 1,100 of them considered the new fuel better than "straight" non-premium gasoline on starting, and that on all the other points over 1,200 agreed that the new fuel was superior. Most of the dissenting votes merely reported "no difference noticed"; hardly anyone considered the unblended gasoline better.

The farmers of the communities concerned are sufficiently interested in the project to be willing to pay a premium of two or three cents a gallon for alcoholized gasoline, provided the alcohol is produced from surplus grain, the report stated.

One driver in Peoria, Ill., who repeated a 128-mile road trip, using 10 per cent. alcohol gas, regular gas, and ethyl gas, found that with alcohol gas his fuel cost was 1.48 cents a mile; with regular gas 1.53 cents a mile and with ethyl gas 1.60 cents a mile; and this in spite of the fact that he was paying 18.6 cents a gallon for the alcohol gas, as against 14.6 cents and 18 cents respectively for the other fuels.

The tests were conducted for the most part on gasoline containing an added ten per cent. of alcohol, which is double the highest percentage contemplated

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in the bill now before Congress. However, the provisions of this measure are such that the oil producer is not required to use alcohol in all his gasoline. He may, if he likes, add a high percentage to his lowest-grade gasoline, thereby raising its quality and hence also its price, while continuing to sell his "straight" and "premium" gasolines unmixed. This, advocates of the bill claim, will do much toward solving the problem of the cheapest grades of gasoline, which at present are not very profitable for the producer nor particularly satisfactory to the consumer.

Science News Letter, May 13, 1933

PLANT PATHOLOGY

Stoppage of Research Ruined Chocolate Industry

A CLEAN-CUT example of the short-sightedness of "economy" that results in the stopping of scientific research is offered by the South American republic of Ecuador. The depression hit there earlier than it did in the United States, an economy program stopped research, and the evil harvest thereof is already being reaped.

Fifteen years ago Ecuador, then one of the principal exporters of cacao (chocolate), was disturbed by a disease attacking the pods from which the chocolate is manufactured. Although the value of the cacao exceeded the value of all the rest of the country's exports combined, there had been no serious attempt to protect it against pests. Studies of this disease were begun, but with the depression of 1921 most of the research work was discontinued; in a few years the uncontrolled spread of the disease forced the abandonment of one of the best of the cacao varieties.

The lapse in the cacao research work proved doubly inopportune. Just at this time a witches-broom disease became conspicuous in one of the important cacao districts. In four years the yield in this district declined to less than one-fortieth of its original volume, and the jungle has taken many of the plantations. The disease spread to other parts of the country and the cacao exports of Ecuador during a period of increasing world consumption dropped by 1930 to less than half their former volume. Resumption of investigative effort has shown that resistant varieties can be produced and the industry may be reestablished, but too late to save the existing plantations in the regions most affected by the disease.

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AGRICULTURE

Research Always Chief End Of Department of Agriculture

By HENRY A. WALLACE,
Secretary of Agriculture

IT WAS FOR the purpose of putting science to work in agriculture that this Federal Department of Agriculture was established by Act of Congress 71 years ago. Washington, Jefferson, and Franklin saw the need for it even back in their day. The department was created primarily for scientific research, its main job always has been a research job, and I hope research will always remain a principal duty.

Of course it is not enough to discover facts: a public institution has also the obligation to see that the facts are made available to all who can profit by them.

When a plant breeder in the department develops a variety of wheat that is highly resistant to rust, the job of the department has not ended with that discovery. The new variety has to be tried out in various regions, in the field. Next, the results of those trials have to be made known to wheat growers. That involves publications, both technical and popular, and articles for the press, and radio broadcasting. Then the seed of the new variety has to be made available to farmers. The county extension agent may step into the picture at this point, and suggest that the interested wheat grower sow some of the new seed in a test plot, alongside some of the seed he and his neighbors have been using in the past. And when the old and the new varieties of wheat are up, and are harvested, let the neighbors for miles around come in to compare them, and decide whether or not the new variety is better than the old, and worth investing in.

Envied by Nations

That is a thumbnail sketch of the way science is applied to agriculture in this country, and it portrays a system that is the envy of many another nation. Sir Horace Plunkett, Ireland's great authority on agriculture, in 1928 was moved to describe the Department of Agriculture as "the most widely useful department in the world." I am inclined to agree, and I only hope that its future will be as brilliantly successful as in past.

Whether he knows it or not, every farmer in the United States is farming differently today—and better—because of the scientific discoveries resulting from State and Federal appropriations. The average hour of man labor and the average acre of land is undoubtedly twenty to thirty per cent. more productive today because of this scientific work. From the fundamental point of view—that of supplying the food and fibre needed by our modern civilization—the millions of dollars spent by State and Federal agencies during the past generation have been abundantly worthwhile . . . .

Job Never Over

No, the job of scientific research in agriculture is not over, nor will it ever be. But today we have a new job, a new field for experimenting—that of social control. Research to increase productive efficiency, to widen markets, must continue. Eliminate the less important research activities, in deference to the need for economy; get rid of the dead wood in our scientific organizations—but keep the men of science at the tasks which will always need doing. And add to the old job, the one that has been begun so well, this new job of developing the machinery of social control. . . .

For that is our great modern problem. Having conquered the fear of famine, with the aid of science, having been brought into an age of abundance, we now have to learn how to live with abundance. Sometimes I think it requires stronger characters, greater hearts and keener minds, to endure abundance than it takes to endure penury. Certainly it requires a new degree of tolerance among competing economic groups, and a willingness to subordinate the will of the few to the welfare of the many.

Personally, I think the last twelve years have imprinted this lesson deeply on all of us. I think we are ready, now, to reach out towards a new order.

The foregoing article consists of excerpts of an address delivered in Washington on May 1 by Secretary Wallace; reproduced in the SCIENCE NEWS LETTER by permission.

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PLANT PATHOLOGY

NATURE RAMBLINGS
by Frank Thone

Tangled Lives

THERE ARE throughout the plant and animal kingdoms hosts of species that have forsaken their ancestors' honorable ways of getting a living: patiently making food out of air and water and sunlight, in the case of green plants, or the vigorous, forthright killing and eating practised by the more familiar animals. These parasitic creatures creep about the world, fastening themselves on the bodies of unwilling hosts or insinuating themselves into their internal tissues, and there spend their degraded lives eating food they never had any part in preparing or capturing.

This way of life is repulsive to our way of thinking, and the very appearance of a parasite sets most of us to squirming. But there are some parasites that are not content even with an ordinarily abnormal existence: they must complicate it by insisting on having two or more different hosts at different times in their lives. And they will not complete their evil cycle unless they can do it in just the prescribed way.

The several white pine species in this country, for example, are at present having the struggle of their lives with a fungus disease called blister rust. It causes big, watery blisters to appear on the branches, and eventually kills the trees, or at least ruins them for timber or ornamental purposes. It spread through the white pine woods of the East like wildfire once it was introduced from Europe, and now has crossed the Canadian line southward into the even greater white pine stands in the Rocky Mountain and Pacific areas.

Yet this fast-spreading disease could not do the pines a penny's worth of harm if there were not in the woods also considerable numbers of wild currants and gooseberries—or cultivated gardens of these fruits nearby. For the blister rust fungus must go from pine to currant or gooseberry, and from the bush back to pine again. It cannot travel from tree to tree, nor from bush to bush. The currant-gooseberry genus is its nurse, that nourishes it when it is young, and then lets it go on to heartier food when it is a bit more grown.

The same relation of "alternate hosts" is maintained by the black stem rust of wheat and other cereals. This fungus requires the presence of European barberry bushes to give it a start in the spring, although once started it can travel from wheat to wheat all summer. A somewhat similar cycle is followed by the crown rust of oats, with buckthorn bushes playing the role of alternate hosts.

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Cover Picture

ALMOST as silently as you view the new domed building in the cover picture, this all-steel structure is rising at the U. S. Naval Observatory in Washington. There is no hammering of rivets to fray the nerves of humans and upset the accuracy of the delicate Naval Observatory clocks that regulate timepieces throughout the country.

Economy, rigidity of construction and light-proof domes are also claimed as advantages of welding.

In addition to this building, 35 feet high and 33 feet in diameter, a smaller one 25 feet in height is being erected. The dark curved steel piece in the foreground is the cover for the opening of the large dome.

These buildings are to house new 15- and 40-inch telescopes.

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BIOLOGY

One-Celled Animals Grown On Wholly Inorganic Diet

ANIMALS feeding and growing new generations of themselves, on a wholly inorganic diet of a type hitherto considered suitable only for plants equipped with the green synthesizing pigment chlorophyll, have been reared in the zoological laboratory of the Johns Hopkins University by Prof. S. O. Mast and Dr. D. M. Pace.

The animals were the one-celled primitive species known as *Chilomonas paramecium*. They were "planted" in a sterile culture medium containing sodium acetate, ammonium chloride, magnesium sulphate and potassium phosphate. Under normal conditions the animals reproduce rapidly by division into two parts, and they usually contain relatively large quantities of starch and fat. In the culture solution they gave rise to 3.4 new generations a day. When sodium silicate was added their reproduction rate went up to 3.9 generations a day.

When the solution was made up minus the organic salt, sodium acetate, the reproduction rate went on at the same level for three or four days, but then the animals died. But in the same totally inorganic solution with a heavy increase in carbon dioxide in the air over it—20 per cent. instead of the normal 3 per cent.—growth and reproduction went on indefinitely and specimens produced were well filled with starch and fat.

A hint of the cause of death when both the acetate and the carbon dioxide were low is contained in the fact that under these conditions the individual animals are very small, containing little starch and fat. Death under these conditions is therefore probably due to starvation.

For some unknown reason, the silicate salt seems to be necessary in the all-inorganic culture solution. If it is omitted, the animal divides a few times and then dies. Silicon is not usually an indispensable element to either plants or animals. The Johns Hopkins investigators suggest that in this case it probably acts as a catalyst, that is, as an agent for producing chemical transformations without itself taking part in them.

The results obtained, they state in conclusion, indicate that only eight chemical elements are necessary: nitrogen, carbon, hydrogen, oxygen, potassium, magnesium, phosphorus and sulphur. But they hold that traces of a number of other elements are probably also necessary.

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•First Glances at New Books

Mathematics

MATHEMATICAL EXCURSIONS—Helen Abbot Merrill — *Author, Wellesley, Mass.,* 145 p., $1.75. This is a useful addition to the literature on mathematical recreation, written by the professor of mathematics emeritus in Wellesley College, who selected the problems over a period of years with no thought of making public use of them. But they have now been gathered into this book which should prove helpful to high school teachers and give amusement and guidance to more alert pupils.

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Animal Behavior

COLONY-FOUNDING AMONG ANTS—William Morton Wheeler—*Harvard Univ. Press,* 179 p., $2. This book, in which Prof. Wheeler discusses some exceedingly primitive behavior traits found among the famous "bulldog" ants of Australia and their significance in the phylogeny of ant behavior generally, will be of keen interest to biologists, and especially to entomologists and students of animal behavior. (See also SNL, Dec. 10, '32, p. 373.)

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Neurology

THE OUTLINE OF THE CRANIAL NERVES—John Favill—*University of Chicago Press,* 112 p., $1.50. A compact handbook for medical students beginning the course in neurology. The author considers the subject of the cranial nerves as the cornerstone of clinical neurology. In this discussion each nerve is considered under five heads; anatomy, function, tests, pathology and localization. Too technical for the layman, but it should be very helpful to the medical student.

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Home Economics

JUNIOR HOME ECONOMICS—Mata Roman Friend and Hazel Shultz—*Appleton,* 304 p., $1.10. A practical text for high school classes. It covers food preparation, nutrition and marketing.

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Medicine

CALCIUM METABOLISM AND CALCIUM THERAPY—Abraham Cantarow—*Lea & Febiger,* 252 p., $2.50. This second edition of Dr. Cantarow's instructive book has been thoroughly revised to include the latest developments in this rapidly changing field. There is an introduction by Hobart Amory Hare, late professor of therapeutics in Jefferson Medical College. The book is written for physicians and scientific investigators.

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Psychology

SEVEN PSYCHOLOGIES—Edna Heidbreder—*Century,* 450 p., $3. A birds-eye-view of some of the varying schools of thought which are important to this science. The seven selected for discussion are: Structuralism, the Psychology of William James, Functionalism, Behaviorism, Psychoanalysis, Dynamic Psychology, and Gestalt Psychology. The book is interesting and helpful to the student, though not so spectacular as its vivid jacket might lead one to hope or fear.

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Engineering—Juvenile Literature

DIGGERS AND BUILDERS—Henry B. Lent—*Macmillan,* 68 p., $1.50. ABC of practical engineering construction written for youngsters by a father, aided by his six-year-old son. Dan the Derrick Man, Sam the Cement Mixer and other makers of the building next door were interviewed. An antidote to "whys."

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Hygiene

THE ROAD TO HEALTH, FIRST BOOK—Herman N. Bundesen and Corinne Manry—*Laidlaw,* 96 p., 52c. This health reader, illustrated in pastel shades, uses repetition to emphasize the health lessons.

THE ROAD TO HEALTH, BOOK TWO—Herman N. Bundesen and Corinne Manry—*Laidlaw,* 127 p., 56c.

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Mathematics

GEOMETRY WORKBOOK—Royal A. Avery—*Allyn and Bacon,* 251 p., 80c. Ninety exercises based on the author's plane geometry but covering the whole field of geometry in such a way that it may be used with any text. There are 600 diagrams.

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Medicine

PROCEDURES IN TUBERCULOSIS CONTROL—Benjamin Goldberg—*F. A. Davis Co.,* 373 p., $4. A most comprehensive and practical discussion of the tuberculosis problem from every aspect, written by a physician and administrator of wide experience. The book will be valuable to physicians, nurses, sanitorium superintendents, and to municipal or other public officials whose duties are related to the tuberculosis problem. Public-spirited citizens will also find much information to guide them in their efforts to improve the tuberculosis situation in their communities.

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Chemistry

INTRODUCTORY CHEMISTRY WITH HOUSEHOLD APPLICATIONS—Nellie M. Naylor and Amy Le Vesconte—*Century,* 367 p., $2.60. Written by two professors of chemistry who are women this text is designed for use in first year chemistry courses in colleges and universities where women students are enrolled. The illustrative material consists of household applications of chemical principles rather than industrial applications.

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Astronomy

SUNDIALS—Bureau of Standards—*Government Printing Office,* 6 p., 5c. The construction of a horizontal sundial with drawings showing the method of laying out the dial is given in this circular.

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General Science

EVERYDAY PROBLEMS IN SCIENCE—Charles John Pieper and Wilbur L. Beauchamp—*Scott Foresman and Co.,* 734 p., $1.60. A revised edition of a widely used general science text.

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General Science

ANNUAL REPORT OF THE DIRECTOR TO THE BOARD OF TRUSTEES, 1932, *Field Museum of Natural History,* 429 p., $1.

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